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10/597,981	08/15/2006	Yasunori Kijima	09792909-6759	8816

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EXAMINER	
CLARK, GREGORY D	

ART UNIT	PAPER NUMBER
1794	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/597,981	KIJIMA ET AL.	
	Examiner	Art Unit	
	GREGORY CLARK	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *08/15/206*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. **Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Tsutsui (JP2003/264085).**

3. **Regarding Claim 1,** Tsutsui discloses an organic semiconductor element (device) obtained by alternately (stacked or adjacent structure) laminating organic thin film layers and thin conductive film layers (abstract). Tsutsui discloses that the organic thin layers function as the light emitting layers (plurality) (paragraph 20). The examiner takes the position the thin conductive layers are equivalent to charge generating layers. Tsutsui discloses that the organic structure of the device is provided between a positive electrode and a negative electrode (abstract). The thin conductive film layers can be made from alkali metal oxides (paragraphs 103 and 104).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claims 7-8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui (JP2003/264085).**

5. **Regarding Claims 7-8,** Tsutsui discloses that the thin conductive layer (charge generating layer) can contain metal phthalocyanines or non-metal phthalocyanines (organic compounds) (paragraphs 105 and 106). Tsutsui fails to mention that the charge generating layer is interfaced with the cathode. The examiner takes the position that through routine experimentation a person of ordinary skill at the time of the invention would readily vary the location of the layers including positioning the charge generating layer to interface with the cathode in the course of optimizing the light emitting efficiency. There is a clear reason to try with a reasonable expectation of success.

Tsutsui teaches that the thin conductive layer (charge generating layer) can contain an organic compound/ charge transport material (paragraph 105). Tsutsui also discloses that the organic compound has an intrinsically outstanding insulation effect (paragraph 4).

6. **Claims 2-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui (JP2003/264085) and Arai (6,340,537).**

7. **Regarding Claims 2 and 3, 6,** Tsutsui discloses that the thin conductive layer (charge generating layer) can be made of metal oxides of aluminum, magnesium, and lithium (paragraphs 103 and 104). Tsutsui also teaches that the thin conductive layer (charge generating layer) can contain an organic compound (charge transport material) (paragraph 105). Tsutsui fails to teach lithium silicate (Li_2SiO_3) used in the charge generating layer.

Arai teaches an organic electroluminescent device containing a hole injecting electrode, a negative electrode, and one or more organic layers between the electrodes wherein at least one of said organic layers has a light emitting function (abstract). The hole injecting layer (charge generating layer) is selected from a metal and/or its oxide or silicate (column 2, lines 21-24). The electron (hole) injecting (transporting) layer contains at least one oxide selected from strontium oxide, magnesium oxide, calcium oxide, lithium oxide, rubidium oxide, potassium oxide, sodium oxide and cesium oxide (column 5, lines 49-52). Arai clearly teaches that a metal oxide (i.e., lithium oxide) and the respective silicate (lithium silicate/ Li_2SiO_3) can be used in the charge generating layer as the applicant.

With the expectation of favorable results, a person of ordinary skill in the art at the time of the invention with the teaching of Tsutsui and Arai would readily modify the charge generating layer of Tsutsui by incorporating the lithium silicate/ Li_2SiO_3 taught by Arai. The motivation for combining the references would have been to produce an organic electroluminescent device that exhibits an excellent hole injecting efficiency and an improved light emitting efficiency and which can be operated at a low drive voltage and manufactured at a reduced cost (abstract).

8. **Regarding Claims 4 and 5,** Tsutsui teaches alternately (stacked or adjacent structure)) laminating organic thin film layers and thin conductive film layers (charge generating layers) (abstract). Arai teaches charge generating layers made of lithium silicate (Li_2SiO_3) which exhibits an excellent hole injecting efficiency. Tsutsui and Arai fail to mention stacked or alternating layers of lithium silicate (Li_2SiO_3) / a charge transport material or that the metal oxide layer interfaces with the anode.

With the expectation of success, a person of ordinary skills in the art with the teachings of Tsutsui and Arai would through routine experimentation would try various single component (Li_2SiO_3) or combinations of materials including Li_2SiO_3 and a charge transport material in the charge generating layers in order to optimize the charge transporting performance. Moreover, through routine experimentation the various layers would be manipulated with respect to their location which includes positioning the lithium silicate (Li_2SiO_3) in the charge generation layer to interface with the anode. The

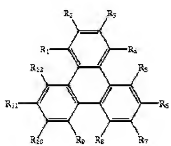
motivation for such modifications in layer location would have been to optimize the overall electroluminescence efficiency.

9. **Claims 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui (JP2003/264085) and Ishiskawa (6,492,041).**

Regarding Claim 9, Tsutsui discloses that the thin conductive layer (charge generating layer or electron/hole transporting layer) can be made from metal phthalocyanines and non-metal phthalocyanine (paragraphs 105 and 106) but fails to teach the use of triphenylenes (formula 1 shown below).

..... Formula (1)

Ishiskawa teaches an organic electroluminescent device containing a luminescent layer and a hole transport layer (electron transport layer) composed of a triphenylene compound (abstract) represented by the structure shown below.



Ishiskawa also discloses that triphenylene compounds having a diarylamino group give excellent organic electroluminescent devices exhibiting an especially high luminance (column 2, lines 1-9).

At the time of the invention, a person of ordinary skill in the art with the teaching of Tsutsui and Ishiskawa would readily modify the charge generating layer of Tsutsui by incorporating the triphenylene compounds taught by Ishiskawa. The motivation for combining the reference would have been to improve the injection efficiency of holes into the light-emitting layer (column 1, lines 25-30).

10. **Regarding Claim 10**, Tsutsui discloses that the thin conductive layer (charge generating layer) can be made of metal oxides of aluminum, magnesium, and lithium (paragraphs 103 and 104). Tsutsui also teaches that the thin conductive layer (charge generating layer) can contain an organic compound/ charge transport material (paragraph 105). Tsutsui also discloses that the organic compound has an intrinsically outstanding insulation effect (paragraph 4). Tsutsui does not mention specifically that the metal oxide is interfaced with the anode.

With the reasonable expectation of success, through routine experimentation the various layers would be manipulated with respect to their location which includes positioning the oxide in the charge generation layer to interface with the anode. The motivation for such modifications in layer location would have been to optimize the overall electroluminescence efficiency.

11. **Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui (JP2003/264085) and Ueda (6,180,217).**

12. **Regarding Claims 11-13,** Tsutsui discloses an organic semiconductor element (device) obtained by alternately (stacked or adjacent structure) laminating organic thin film layers and thin conductive film layers (abstract). Tsutsui discloses that the organic thin layers function as the light emitting layers (plurality) (paragraph 20). The examiner takes the position that the thin conductive layers are equivalent to charge generating layers.

Tsutsui fails to teach an interfacial layer on the anode side of each charge generation layer (hole/ electron injection or transporting layer) composed of a fluoride compound of an alkali metal or alkaline earth metal.

Ueda teaches that an electron-injection layer (7) may be interposed between the organic luminescent layer (4) and negative (anode) electrode (5) as shown in figure 2 below:

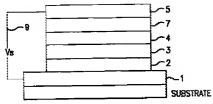


FIG.2

Ueda further discloses that it is desirable to form the electron-injection layer using a mixed layer of an electron transporting material (conducting material or organic compound) and metal or metal fluoride layer. The examiner takes the position that the metal fluoride is being formed on the electron transporting material (conducting material). Ueda discloses that the metal fluoride conducting materials include LiF and MgF_2. The brightness of the luminescent element can be increased by the formation of such an electron-injection layer, and the drive voltage can be reduced to prolong the service life (column 31, lines 44-51).

With a reasonable expectation of success, a person of ordinary skill in the art at the time of the invention with the teachings of Tsutsui and Ueda would readily modify the charge generating layer of Tsutsui and create an interfacial layer (containing a metal fluoride) based on the teachings of Ueda. The motivation for doing so would have been to incorporate materials having a large ionization potential (metal fluoride) into the hole-transporting layer to produce a device which requires a low voltage to initiate luminescence, provides luminescence efficiency and stability over a long service life (column 33, lines 30-38).

13. **Claims 14-15 and 18, 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui (JP2003/264085) and Ueda (6,180,217) as applied to claim 11 above.**

14. **Regarding Claims 14,** Tsutsui discloses that the thin conductive layer (charge generating layer) can be made from metal phthalocyanines and non-metal phthalocyanine (paragraphs 105 and 106). Tsutsui fails mention that the charge generating layer is interfaced with the cathode.

The examiner takes the position that through routine experimentation a person of ordinary skill at the time of the invention would readily vary the location of the stacked layers including positioning the charge generating layer to interface with the cathode in the course of optimizing the light emitting efficiency.

15. **Regarding Claims 15,** Tsutsui teaches that the thin conductive layer (charge generating layer) can contain an organic compound/ charge transport material (paragraph 105). Tsutsui discloses the use of phthalocyanines in the charge generating layer (paragraph 106). Tsutsui also discloses that the organic compound has an intrinsically outstanding insulation effect (paragraph 4).

16. **Regarding Claim 18**, Tsutsui discloses an organic semiconductor element (device) obtained by alternately (stacked or adjacent structure)) laminating organic thin

film layers and thin conductive film layers (abstract). Tsutsui discloses that the organic thin layers function as the light emitting layers (plurality) (paragraph 20). The examiner takes the position the thin conductive layers are equivalent to charge generating layers and the structure disclosed by Tsutsui represents light-emitting and charge generating layers arranged in an adjacent fashion. Tsutsui also teaches that the thin conductive layer (charge generating layer) can contain an organic compound/ charge transport material (paragraph 105). Tsutsui discloses that organic structure of the device is provided between a positive electrode and a negative electrode (abstract). Tsutsui fails to mention that the charge generation layer contains alkali or alkaline earth metals.

Ueda discloses that it is desirable to form the electron-injection layer using a mixed layer of an electron transporting material (conducting material or organic compound) and metal or metal fluoride layer (composed of alkali or alkaline earth metals). The examiner takes the position that the metal fluoride is being formed on the electron transporting material (conducting material). The brightness of the luminescent element can be increased by the formation of an electron-injection layer containing metal fluorides, and the drive voltage can be reduced to prolong the service life (column 31, lines 44-51). Tsutsui and Ueda fail to mention that the layers are in contact with each other from the side of the anode.

The examiner takes the position that through routine experimentation a person of ordinary skill at the time of the invention would readily vary the location of the stacked layers including positioning the charge generating layer containing the organic compound and the alkali or alkaline earth metals to interface with any layer in the device

in the course of optimizing the injection efficiency of holes into the light-emitting layer to achieve optimal luminescent output with a minimum voltage input. Such manipulations of layer location would be based on routine experimentation designed to optimize the device performance, absent unexpected results.

17. **Regarding Claim 20,** Tsutsui and Ueda teach the invention of claim 18 described above. Tsutsui and Ueda fail to mention the alkali/alkaline metals in the mixed layer at more than 50% in terms of the relative thickness percentage. Ueda discloses the effect alkali/alkaline metals have on the charge generating or hole transporting layer device performance. The incorporation of materials (alkali/alkaline metals) having a large ionization potential into the hole-transporting layer produce devices which require a lower voltage to initiate luminescence, provide luminescence efficiency and stability over a long service life (column 33, lines 30-38).

With a reasonable expectation of success, at the time of the invention a person of ordinary skill in the art would adjust the percent amount of the alkali/alkaline metals in the charge generating layer to optimize the voltage requirements, luminescence efficiency, and overall stability of the device.

18. **Regarding Claim 21,** Tsutsui and Ueda teach invention of claim 18 described above. Tsutsui and Ueda fail to specifically mention an interfacial layer composed of a fluoride on the anode side.

The examiner takes the position that through routine experimentation a person of ordinary skill in the art at the time of the invention would readily vary the location of the stacked layers including positioning the alkali/alkaline metals in the charge generating layer to interface on the anode side in the course of optimizing the injection efficiency of holes into the light-emitting layer to achieve optimal luminescent output with a minimum voltage input. Such manipulation of layer location would be based on routine experimentation designed to improve overall performance, absent unexpected results.

19. **Regarding Claim 22,** Tsutsui and Ueda teach invention of claim 18 described above. Tsutsui discloses that the thin conductive layer (charge generating layer) can contain metal phthalocyanines or non-metal phthalocyanines (paragraphs 105 and 106). Tsutsui and Ueda fail to mention an interfacial layer composed of a phthalocyanine on the anode side.

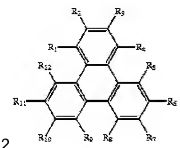
The examiner takes the position that through routine experimentation a person of ordinary skill in the art at the time of the invention would readily vary the location of the stacked layers including positioning the interfacial layer composed of a phthalocyanine compound on the cathode side in the course of optimizing the injection efficiency of holes into the light-emitting layer to achieve optimal luminescent output with a minimum voltage input. Such manipulation of layer location would be based on routine experimentation designed to improve overall performance, absent unexpected results.

20. **Claims 16, 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui (JP2003/264085) and Ueda (6,180,217) as applied to claim 11 above, and further in view of Ishiskawa (6,492,041).**

21. **Regarding Claim 16**, Tsutsui discloses that the thin conductive layer (charge generating layer or electron/hole transporting layer) can be made from metal phthalocyanines and non-metal phthalocyanine (paragraphs 105 and 106). Ueda discloses that the metal fluorides conducting materials include LiF and MgF_2 can be used in the charge generating layer. Both Tsutsui and Ueda fail to teach the use of triphenylenes in the charge generating layer (formula 1 shown below).

..... Formula (1)

Ishiskawa teaches an organic electroluminescent device which includes a luminescent layer and a hole transport layer (electron transport layer) composed of a triphenylene compound (abstract) represented by the formula 2 shown below.



Formula 2

Ishiskawa also discloses that triphenylene compounds having a diarylamino group give excellent organic electroluminescent devices exhibiting an especially high luminance (column 2, lines 1-9).

At the time of the invention, a person of ordinary skill in the art with the teaching of Tsutsui/ Ueda and Ishiskawa would readily modify the charge generating layer of Tsutsui/ Ueda by incorporating the triphenylene compounds taught by Ishiskawa. The motivation for combining the references would have been to improve the injection efficiency of holes into the light-emitting layer (column 1, lines 25-30).

22. **Regarding Claim 17**, Tsutsui ,Ueda and Ishiskawa teach the invention of claim 16 as described above.

Tsutsui ,Ueda and Ishiskawa fail to specifically teach a device where the organic compound forms an intrinsic charge generation layer in contact with the interfacial layer.

The examiner takes the position that through routine experimentation a person of ordinary skill in the art at the time of the invention would readily vary the location of the stacked layers including positioning the charge generating layer containing the organic compound to interface with any layer in the device in the course of optimizing the injection efficiency of holes into the light-emitting layer to achieve optimal luminescent output with a minimum voltage input. Such manipulation of layer location would be based on routine experimentation designed to improve the overall device performance, absent unexpected results.

23. **Regarding Claim 19,** Tsutsui and Ueda teach invention of claim 18 described above. Tsutsui and Ueda fail to mention a charge generation layer containing a triphenylene compound (formula 1 shown above).

Ishiskawa teaches an organic electroluminescent device that includes a luminescent layer and a hole transport layer (electron transport layer) containing a triphenylene compound (abstract) represented by the formula 2 shown above.

At the time of the invention, a person of ordinary skill in the art with the teaching of Tsutsui/ Ueda and Ishiskawa would readily modify the charge generating layer of Tsutsui/ Ueda by incorporating the triphenylene compounds taught by Ishiskawa. The motivation for combining the reference would have been to improve the injection efficiency of holes into the light-emitting layer (column 1, lines 25-30).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY CLARK whose telephone number is (571)270-7087. The examiner can normally be reached on M-Th 7:00 AM to 5 PM Alternating Fri 7:30 AM to 4 PM and Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on (571) 272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1794

GDC